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Indian Standard

SPECIFICATION FOR NICKEL FORMATE FOR NICKEL CATALYST

(*First Revision*)

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 4 *June* 1983

Indian Standard

SPECIFICATION FOR NICKEL FORMATE FOR NICKEL CATALYST

(First Revision)

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Indian Standard

SPECIFICATION FOR NICKEL FORMATE FOR NICKEL CATALYST

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 28 February 1983, after the draft finalized by the Inorganic Chemicals (Misc) Sectional Committee had been approved by the Chemical Division Council.

0.2 Nickel formate is extensively used for the manufacture of nickel catalyst by reduction process. Nickel catalyst is widely used at present for hydrogenation of oils to convert liquid oils into semi-solid fats for use in VANASPATI and into hard and extra hard fats for industrial purposes for use in soap, grease and stearic acid industries. The manufacturers generally purchase nickel formate and prepare their own catalyst. Necessity was, therefore, felt for the preparation of an Indian Standard on the subject.

0.3 In the preparation of this standard, substantial assistance had been derived from the data provided by Regional Research Laboratory (CSIR), Hyderabad.

0.4 In the present revision, a new requirement of chloride has been incorporated, the sulphate requirement has been reduced to 0·2 percent against the existing limit of 0·5 percent by mass.

0.4.1 The colorimetric method for the determination of lead has been specified to replace the gravimetric method.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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*Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard prescribes the requirements and the methods of sampling and test for nickel formate used for preparation of nickel catalyst.

2. REQUIREMENTS

2.1 Description — Nickel formate shall be in the form of green coloured fine crystals or finely ground powder corresponding to the formula Ni (COOH $)_2.2H_2O$.

2.2 The material shall comply with the requirements given in Table 1 when tested according to the methods prescribed in Appendix A. Reference to the relevant clauses of Appendix A is given in col 4 of the table.

TABLE 1 REQUIREMENTS FOR NICKEL FORMATE FOR NICKEL CATALYST

SL No. (1)	CHARACTERISTIC (2)	REQUIREMENT (3)	METHOD OF TEST (REF TO CL NO. IN APPENDIX A) (4)
i)	Nickel (as Ni), percent by mass, *Min*	30·93	A-2
ii)	Iron (as Fe), percent by mass, *Max*	0·05	A-3
iii)	Zinc (as Zn), percent by mass, *Max*	0·01	A-4
iv)	Lead (as Pb), percent by mass, *Max*	0·01	A-5
v)	Copper (as Cu), percent by mass, *Max*	0·02	A-6
vi)	*p*H, *Min*	2·0	A-7
vii)	Acid insoluble matter, percent by mass, *Max*	0·20	A-8
viii)	Sulphates (as SO_4), percent by mass, *Max*	0·2	A-9

3. PACKING AND MARKING

3.1 Packing — Unless otherwise agreed to between the purchaser and the supplier, the material shall be packed in polyethylene lined jute bags or well-closed mild steel drums.

3.2 Marking — Each container shall be legibly and indelibly marked with the following information:

a) Name of the material;
b) Net mass;
c) Year of manufacture;
d) Name of the manufacturer and/or his trade-mark, if any; and

e) Batch number to enable the lot of manufacture to be traced from records.

3.2.1 The containers may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

4. SAMPLING

4.1 The method of drawing representative samples of the material, the number of tests to be performed and the criteria for conformity of the material to the requirements of this standard shall be as prescribed in Appendix B.

APPENDIX A

(*Clause* 2.2)

METHODS OF TEST FOR NICKEL FORMATE

A-1. QUALITY OF REAGENTS

A-1.1 Unless specified otherwise, pure chemicals and distilled water (*see* IS : 1070-1977*) shall be used in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

A-2. DETERMINATION OF NICKEL

A-2.1 Reagents

A-2.1.1 *Dimethylglyoxime Solution* — 1 percent (*m/v*) in alcohol.

A-2.1.2 *Dilute Sulphuric Acid* — 10 percent (*v/v*).

A-2.1.3 *Ammonium Hydroxide* — 20 percent (*v/v*).

---

*Specification for water for general laboratory use (*second revision*)

A-2.1.4 *Tartaric Acid or Citric Acid* — solid.

A-2.2 Procedure — Weigh accurately about 2 g of the material. Dissolve it in about 100 ml of water and 2 ml of dilute sulphuric acid and dilute to 250 ml with water in a measuring flask. Take a 25-ml aliquot, add 0·5 g of tartaric acid or citric acid, dilute to 250 ml and heat to 70°C. Add 30 ml of dimethylglyoxime solution followed by ammonium hydroxide with constant stirring until precipitation takes place and then in slight excess. Keep it on steam-bath for 25 to 30 minutes and test the solution for complete precipitation after the red precipitate has settled down. Allow the precipitate to stand for one hour. Filter the cold solution through a tared Gooch crucible (or sintered glass crucible No. G 4) previously heated to 110-120°C. Dry the precipitate at 110 to 120°C for about an hour. Cool in a desiccator and weigh. Repeat the drying until constant mass is obtained.

A-2.3 Calculation

$$\text{Nickel, percent by mass} = \frac{203\,2\, M_1}{M}$$

where

M_1 = mass in g of the dried precipitate, and
M = mass in g of the material taken for the test.

A-3. TEST FOR IRON

A-3.1 Apparatus

A-3.1.1 *Nessler Cylinders* — 50 ml capacity.

A-3.2 Reagents

A-3.2.1 *Concentrated Hydrochloric Acid* — *See* IS : 265-1976*.

A-3.2.2 *Concentrated Nitric Acid* — *See* IS : 264-1976†.

A-3.2.3 *Dilute Ammonium Hydroxide* — 1 : 10 (*v/v*).

A-3.2.4 *Dilute Hydrochloric Acid* — 4 N approximately.

A-3.2.5 *Ammonium Hydroxide* — 1 : 4 (*v/v*).

A-3.2.6 *Ammonium Persulphate* — solid.

A-3.2.7 *Ammonium Thiocyanate Solution* — 5 percent (*m/v*).

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*Specification for hydrochloric acid (*second revision*).
†Specification for nitric acid (*second revision*).

A-3.2.8 *Standard Iron Solution* — Dissolve 0·702 g of ferrous ammonium sulphate hexahydrate [$FeSO_4(NH_4)_2SO_4.6H_2O$] in about 100 ml of water containing 10 ml of dilute [10 percent (*v/v*)] sulphuric acid and dilute to 1 000 ml with water in a measuring flask. One millilitre of this solution contains 0·1 mg of iron (as Fe).

A-3.3 Procedure — Weigh accurately 1·0 g of the material and dissolve in 20 ml of water. Add 2 ml of concentrated hydrochloric acid and 5 drops of concentrated nitric acid. Heat to boiling, cool and add dilute ammonium hydroxide to completely precipitate ferric hydroxide. Filter through a filter paper and wash the precipitate with dilute ammonium hydroxide until the washings are colourless. Dissolve the precipitate on filter paper with 5 ml of hot dilute hydrochloric acid and dilute with water to about 20 ml. Transfer to a Nessler cylinder and dilute to the mark. Add about 30 mg of ammonium persulphate, 3 ml of ammonium thiocyanate solution and mix well. Carry out a control test in other Nessler cylinder proceeding as with the material using 5 ml of standard iron solution.

A-3.3.1 The limit prescribed in Table 1 shall be taken as having not been exceeded if the intensity of colour produced with the material is not greater than that produced in the control test.

A-4. TEST FOR ZINC

A-4.1 Apparatus

A-4.1.1 *Nessler Cylinders* — 50 ml capacity.

A-4.2 Reagents

A-4.2.1 *Acridine Hydrochloride Solution* — 1 percent (*m/v*).

A-4.2.2 *Ammonium Thiocyanate Solution* — 10 percent (*m/v*).

A-4.2.3 *Ammonium Thiocyanate Wash Solution* — 1 percent (*m/v*). Just before use add acridine hydrochloride solution (5 ml to each 200 ml of the wash solution).

A-4.2.4 *Dilute Hydrochloric Acid* — 50 percent (*v/v*).

A-4.2.5 *Ammonium Chloride Solution* — 20 percent (*m/v*).

A-4.2.6 *Sodium Carbonate Solution* — 1 N.

A-4.2.7 *Hydrogen Peroxide* — 20 volumes.

A-4.2.8 *Ammonium Chloride Wash Solution* — 1 percent (*m/v*) also containing a few drops of sodium carbonate solution.

A-4.2.9 *Potassium Cyanide Solution* — 0·25 percent (*m/v*).

A-4.2.10 *Acetone* — *See* IS : 170-1976*.

A-4.2.11 *Diphenylcarbazone Solution* — 0·2 percent (*m/v*) in amyl alcohol.

A-4.2.12 *Amyl Alcohol* — *See* IS : 360-1964†.

A-4.2.13 *Cobalt Sulphate Solution* — 1 percent (*m/v*).

A-4.2.14 *Standard Zinc Solution* — Dissolve 0·879 6 g zinc sulphate heptahydrate in water, add 10 ml of dilute sulphuric acid (4 N) and dilute to 1 000 ml. Dilute 50 ml of this solution to 1 000 ml. One millilitre of this solution contains 0·01 mg of zinc (as Zn).

A-4.3 Procedure

A-4.3.1 Weigh accurately 1·0 g of the material and dissolve in 5 ml of water. Add 5 ml of cobalt sulphate solution, followed by 25 ml of acridine hydrochloride solution and mix well. Add slowly with constant stirring 25 ml of ammonium thiocyanate solution. Shake vigorously to coagulate the green cobalt complex. Allow to stand for 10 minutes. Filter through a Whatman No. 541 or equivalent filter paper. Wash the beaker 3 times and the paper 4 times with ammonium thiocyanate wash solution. Place the beaker in which precipitation was carried out under the funnel. Pierce a hole in the filter paper and wash the precipitate with hot water. Pour 10 ml of ammonium chloride solution through the funnel and wash several times with hot water until the paper is colourless. Keep the volume of wash water as low as possible.

A-4.3.2 Place the beaker on a hot-plate to dissolve the precipitate. To the clear hot solution (60-70°C), add from a pipette 10 ml of sodium carbonate solution and 5 ml of hydrogen peroxide. Allow to stand warm for 5 minutes and then cool to room temperature within 20 minutes. (This is important to avoid cobalt interference.) Filter through Whatman No. 541 or equivalent filter paper in a 100-ml beaker. Wash several times with ammonium chloride wash solution. Dilute the filtrate with water to 100 ml. Add 5 ml of potassium cyanide solution. Shake and add 5 ml of acetone. Transfer the solution to a 250-ml separating funnel. Add 20 ml of diphenyl thiocarbazone solution and extract for about one minute. Run off the aqueous layer and transfer the other layer into a dry beaker. Extract the aqueous layer with further 20 ml of diphenylcarbazone solution and combine the two extracts. Pipette 2 ml from the 40 ml of the extract in a Nessler cylinder and dilute to 10 ml with amyl alcohol. Mix thoroughly. Carry out a control test int he same manner using 10 ml of standard zinc solution in place of the material.

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*Specification for acetone (*second revision*).

†Specification for amyl alcohol (*revised*).

A-4.3.3 The limit prescribed in Table 1 shall be taken as not having been exceeded if the intensity of colour produced with the material is not greater than that produced in the control test.

A-5. DETERMINATION OF LEAD

A-5.1 Reagents

A-5.1.1 *Dilute Hydrochloric Acid* — 1 : 1 (*v/v*).

A-5.1.2 *Concentrated Nitric Acid* — *See* IS : 264-1976*.

A-5.1.3 *Concentrated Sulphuric Acid* — *See* IS : 266-1977†.

A-5.1.4 *Wash Solution* — One litre water containing 10 ml of concentrated sulphuric acid and 10 ml of denatured spirit.

A-5.1.5 *Denatured Spirit* — *See* IS : 324-1959‡.

A-5.1.6 *Ammonium Acetate Solution* — Dissolve 30 g of ammonium acetate in 2 litres of water acidified with acetic acid.

A-5.1.7 *Thymol Blue Indicator* — Dissolve 0·04 g of the sodium salt in 100 ml of water.

A-5.1.8 *Lead Buffer Solution* — Dissolve 100 g of ammonium citrate, 20 g of potassium cyanide and 16 g of hydroxylamine hydrochloride in a 2-litre beaker containing about 100 ml of demineralized water. Add concentrated ammonium hydroxide until the *p*H of the solution is 8 5. Transfer to a large separatory funnel. Remove heavy metals by extracting the buffer solution with 15 ml portions of stock dithizone solution (0 01 percent) until dithizone solution is green. Finally confirm complete removal of heavy metals by extracting with 0·001 percent dithizone solution (15 ml). Drain carbon tetrachloride layer out of separatory funnel. Extract excess dithizone from the buffer solution by adding about 25 ml of chloroform and shaking the funnel vigorously. Allow layer to separate. Discard chloroform, then repeat above extraction using several 15 ml portions of chloroform till organic layer is colourless. Drain the final chloroform extract and shake the buffer solution with 25 ml portion of carbon tetrachloride (three extractions may be adequate). Discard the carbon tetrachloride layer and dilute the solution to 2 litres with demineralized water. Keep in a cool place.

A-5.1.9 *Potassium Cyanide Solution (0·1 Percent Aqueous)* — Dissolve 1 g of potassium cyanide (KCN) in one litre of water.

CAUTION : Potassium cyanide is very poisonous. Do not measure a cyanide solution with a pipette operated by mouth and do not add acid to cyanide or cyanide solutions.

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*Specification for nitric acid.

†Specification for sulphuric acid (*second revision*).

‡Specification for ordinary denatured spirit (*revised*).

A-5.1.10 *Standard Lead Solutions (100 µg/ml)*

A-5.1.10.1 Dissolve 0·016 g of dried lead nitrate $Pb(NO_3)_2$ in 100 ml of demineralized water containing 1 ml of concentrated nitric acid.

A-5.1.10.2 *Standard lead solution (10 µg/ml)* — Add 10 ml of above standard to 90 ml of water containing 1 ml of concentrated nitric acid.

A-5.1.10.3 *Standard solution (1 µg/ml)* — Add 10 ml of 10 µg per ml standard solution to 90 ml of water containing 1 ml concentrated nitric acid.

A-5.1.11 Prepare 0·5, 1·0, 2·0, 3 0 and 4·0 microgram standard by pipetting a suitable aliquot from 10 or 1·0 micrograms per ml lead standard solution into 125 ml separatory funnel containing 10 ml of lead buffer solution. Then proceed according to the procedure described in **A-5.3.6** to **A-5.3.9**.

A-5.1.11.1 *Dithizone (0·01 percent)* — Dissolved 0·01 g of dithizone in 100 ml of carbon tetrachloride. Shake intermittently and allow to stand overnight before using. Use borosolicate glass bottle covered with dark paper for storing.

A-5.1.11.2 *Dithizone (0·001 percent)* — Dilute 10 ml of 0·01 percent dithizone with CCl_4 to 100 ml. Prepare daily and keep in a borosolicate glass bottle covered with dark paper away from light. It is inadvissable to pipette dithizone solutions by mouth.

A-5.2 Apparatus

A-5.2.1 *Culture Tubes* — screw capped 25 × 200 mm with wooden stand.

A-5.2.2 *Separating Funnel* — 125 ml capacity.

A-5.2.3 *Graduated Cylinder, Glass-Stoppered* — 25 ml capacity.

A-5.2.4 *Automatic Pipette* — 5 ml capacity.

A-5.3 Procedure

A-5.3.1 Take 5 g of nickel formate sample in 400-ml beaker. Add 10 ml of concentrated nitric acid. Shake gently; after the sample dissolves, add 5-6 ml concentrated sulphuric acid slowly by the side of the beaker. Heat gently. If black particles remain, add another 5 ml of nitric acid. Evaporate to copious fumes. Cool, wash sides of the beaker with a jet of water. Heat to copious fumes again. Cool.

A-5.3.2 Add 90 ml of water. Heat gently over a hot plate. Do not boil. When salts are dissolved, remove from hot plate. Add 10 ml of denatured spirit. Stir with a glass rod and allow to settle for atleast 4 hours or preferably overnight.

A-5.3.3 Filter through Whatman No. 42 filter paper transferring all precipitates, etc with a little filter paper pulp (ashless). Wash with wash solution (**A-5.1.4**) till free from nickel (6-8 times).

A-5.3.4 Dissolve the precipitate on the filter paper by pouring hot ammonium acetate solution on the precipitate. Six portions of 10 ml each are required, each ammonium acetate portion should be followed by hot water. Make combined filtrate to 250 ml in a measuring flask after adding 2 ml of dilute hydrochloric acid.

A-5.3.5 Transfer suitable aliquot to a 125-ml separatory funnel containing 10 ml lead buffer solution.

A-5.3.6 Add 2 drops of thymol blue indicator solution, then add 1 : 1 ammonium hydroxide dropwise while shaking the funnel until the indicator is blue in colour (*p*H 8·5). Cool, if necessary.

A-5.3.7 Add 5 ml of 0·001 percent dithizone solution with automatic pipette and shake the separatory funnel gently for about 15 seconds.

A-5.3.8 Drain the carbon tetrachloride layer into a 25 ml glass stoppered graduated cylinder containing 10 ml of 0·10 percent potassium cyanide.

A-5.3.9 Shake the cylinder gently for about 5 seconds and compare the colour of the carbon tetrachloride layer with those of standards.

A-5.4 If the colour developed with 1 ml of sample solution (that is 0·02 g sample) is less in intensity than that of 2 μg standards, the sample passes the test for lead.

A-6. TEST FOR COPPER

A-6.1 Apparatus

A-6.1.1 *Nessler Cylinders* — 50 ml capacity.

A-6.2 Reagents

A-6.2.1 *Concentrated Hydrochloric Acid* — *See* IS : 265-1976*.

A-6.2.2 *Mercuric Chloride Solution* — 1 percent (*m/v*).

A-6.2.3 *Hydrogen Sulphide* — gas.

A-6.2.4 *Hydrogen Sulphide Water* — freshly prepared, saturated aqueous solution.

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*Specification for hydrochloric acid (*second revision*).

A-6.2.5 *Concentrated Nitric Acid* — *See* IS : 264-1976*.

A-6.2.6 *Ammonium Acetate* — solid.

A-6.2.7 *Potassium Ferrocyanide Solution* — prepared by dissolving 1 g of potassium ferrocyanide in 10 ml of water.

A-6.2.8 *Standard Copper Solution* — Dissolve 0·392 8 g of cupric sulphate in water and make up the solution to 1 000 ml. One millilitre of this solution is equivalent to 0·1 mg of copper (as Cu).

A-6.3 Procedure — Dissolve 1·0 g of the material, accurately weighed, in sufficient water, add 2 ml of concentrated hydrochloric acid and dilute to 50 ml with water. Add 2 ml of mercuric chloride solution and saturate with hydrogen sulphide gas. Filter through a small filter paper, wash with hydrogen sulphide water and ignite the precipitate in a porcelain crucible. Dissolve the residue by warming with 0·5 ml of concentrated nitric acid and a few drops of water and dilute to 10 ml and filter, if necessary. Dissolve in the solution 1 g of ammonium acetate and add 5 drops of potassium ferrocyanide solution. Carry out a control test proceeding exactly as with the material, using 2 ml of standard copper solution.

A-6.3.1 The limit specified in Table 1 shall be taken as having been satisfied if the intensity of the colour produced with the material is not greater than that produced in the control test.

A-7. DETERMINATION OF *p*H

A-7.1 Apparatus

A-7.1.1 *p*H *Meter* — with glass electrode.

A-7.2 Procedure — Dissolve 5 g of the material in freshly boiled and cooled water, dilute to 25 ml and mix. Determine the *p*H value of the solution using *p*H meter.

A-8. DETERMINATION OF ACID IN SOLUBLE MATTER

A-8.1 Reagents

A-8.1.1 *Dilute Sulphuric or Hydrochloric Acid* — 10 percent (*v/v*).

A-8.2 Procedure — Weigh accurately about 10 g of the material and dissolve it in dilute sulphuric acid or dilute hydrochloric acid and make up to about 125 ml with the acid. Heat the solution to boiling, filter through a weighed and prepared Gooch crucible and wash the residue thoroughly with hot water. Dry the crucible at 110 ± 5°C to constant mass.

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*Specification for nitric acid (*second revision*).

A-8.3 Calculation

$$\text{Acid insoluble matter, percent by mass} = 100 \times \frac{M_1}{M}$$

where

M_1 = mass in g of the residue, and
M = mass in g of the material taken for the test.

A-9. DETERMINATION OF SULPHATES

A-9.1 Reagents

A-9.1.1 *Concentrated Hydrochloric Acid — See* IS : 265-1976*.

A-9.1.2 *Barium Chloride Solution* — 10 percent (*m/v*).

A-9.2 Procedure — Weigh accurately about 5 g of the material and dissolve in a mixture of 10 ml of water and 20 ml of concentrated hydrochloric acid. Warm, if necessary, on a Bunsen burner to complete the dissolution. Filter the solution, if not clear. Collect the filtrate and washings in a 500-ml beaker and determine sulphates by the method prescribed in IS : 2317-1975†.

APPENDIX B

(*Clause* 4.1)

SAMPLING OF NICKEL FORMATE

B-1. GENERAL REQUIREMENTS OF SAMPLING

B-1.0 In drawing, preparing, storing and handling test samples, the following precautions and directions shall be observed.

B-1.1 Samples shall not be taken at the place exposed to adverse affects of weather.

B-1.2 The sampling instruments and sample containers shall be clean and dry.

B-1.3 Precautions shall be taken to protect the samples, the material being sampled, the sampling instrument and the containers for samples from adventitious contamination.

B-1.4 To draw a representative sample, the contents of each container selected for sampling shall be mixed as thoroughly as possible by suitable means.

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*Specification for hydrochloric acid (*second revision*).

†Method for gravimetric determination of sulphates (*first revision*).

B-1.5 The samples shall be placed in clean, dry and airtight glass or other suitable containers on which the material has no action.

B-1.6 The sample containers shall be of such a size that they are almost completely filled by the sample.

B-1.7 Each sample container shall be sealed airtight after filling and marked with full details of sampling the date of sampling and the lot and batch numbers.

B-2. SCALE OF SAMPLING

B-2.1 Lot — All the containers in a single consignment of the material drawn from a single batch of manufacture shall constitute a lot. If a consignment is declared or known to consist of different batches of manufacture, the containers belonging to the same batch shall be grouped together and each such group shall constitute a separate lot.

B-2.1.1 Samples shall be tested from each lot for ascertaining conformity of the material to the requirements of the standard.

B-2.2 The number (*n*) of contains to be selected at random from the lot shall depend on the size of the lot and shall be in accordance with Table 2.

TABLE 2 NUMBER OF CONTAINERS TO BE SELECTED FOR SAMPLING

LOT SIZE N (1)	NO. OF CONTAINERS TO BE SELECTED n (2)
Up to 25	2
26 ,, 50	3
51 ,, 100	4
101 and above	5

B-2.3 These containers shall be chosen at random from the lot. For random selection procedures, guidance can be had from IS : 4905-1968*. In case this standard is not readily available, the following procedure shall be adopted:

> ' Arrange all the containers in the lot in a systematic manner and starting from any container, count them as 1, 2, 3 ...... etc, up to *r*, where *r* is the integral part of N/n (N and n being the lot size and the number of containers to be selected respectively). Every *r*th container thus counted shall be withdrawn to constitute the sample. '

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*Method for random sampling.

B-3. TEST SAMPLES AND REFEREE SAMPLE

B-3.1 From each of the containers selected according to **B**-**2.2**, draw with an appropriate sampling instrument a representative portion of the material, sufficient for carrying out the tests specified under **2**. These shall constitute the individual samples.

B-3.2 From each of the individual samples, a small but equal quantity of the material shall be taken and thoroughly mixed to constitute a composite sample.

B-3.3 The material in the individual and composite samples shall be divided into three equal parts and transferred to separate bottles, sealed and labelled with full identification particulars of the samples (*see* **B-1.7**). The material in each such bottle shall constitute a test sample. Separate these test samples representing individual samples and composite sample into three identical sets of tests samples.

B-3.4 One set of test sample shall be sent to the purchaser and another to the supplier. The third set of test samples bearing the seals of the purchaser and the supplier shall constitute the referee sample to be used in case of a dispute between the purchaser and the supplier and shall be kept at a place agreed to between the two.

B-4. NUMBER OF TESTS

B-4.1 Tests for the determination of nickel content shall be carried out on each of the individual samples.

B-4.2 Tests for the determination of the remaining characteristics shall be carried out on the composite sample.

B-5. CRITERIA FOR CONFORMITY

B-5.1 For Individual Sample — The lot shall be declared as conforming to the requirements of nickel content if each of the individual samples separately satisfies the requirement prescribed in Table 1.

B-5.2 For Composite Sample — For declaring the conformity of the lot to the requirements of the characteristics tested in the composite sample, the test result for each characteristic shall satisfy the corresponding requirements of this standard.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Definition*
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2